which it professed to represent, and which has its place in the earlier volumes of our Transactions, would not be unacceptable to the Members of the Royal Society, of which Society Halley has ever been regarded as one of the brightest ornaments.

II. "On the Isolation of the Radical, Mercuric Methyl." By George Bowdler Buckton, Esq., F.R.S. Received December 4, 1857.

(Abstract.)

Dr. Frankland, in his valuable memoir communicated to the Royal Society, has pointed out that hydrargyro-methylium, zinc-ethylium, and analogous bodies may be regarded as formed upon the type of the metallic oxides, the oxygen of which he considered was represented by methyl, ethyl, &c. The hypothetical radical hydrargyro-methylium, $C_2 H_3 \left\{ \begin{matrix} Hg \\ Hg \end{matrix} \right.$, according to this view would correspond to numerous oxides, $O \left\{ \begin{matrix} Hg. \\ Hg. \end{matrix} \right.$

Dünhaupt and Strecker have studied and described the salts of hydrargyro-methylium and hydrargyræthylium, but chemists do not appear, hitherto, to have succeeded in reducing these bodies to the mercuric type, or in preparing the metalloids themselves.

The author has undertaken experiments with a view to the completion of this portion of their history, a brief summary of which he now offers.

Iodide of hydrargyro-methylium was prepared through the agency of sunlight, in the usual manner; and after the removal of every trace of iodide of methyl, it was intimately mixed in a mortar with finely powdered cyanide of potassium. Small charges were then introduced into flasks and distilled over the gas flame. Gaseous and solid products are formed, together with a heavy liquid, which passes into the receiver. After washing with water, and rectification over chloride of calcium, this liquid has the following properties :—

It is colourless, highly refractive to light, and almost wholly insoluble in water. When pure, it has a faint and somewhat sweetish odour. It is very combustible, and burns with a luminous flame and abundant evolution of mercurial vapour. It is very soluble in

alcohol and in ether, from the former of which it precipitates on addition of water. Its boiling-point lies between 93° and 96° C, and its specific gravity is 3·069. It thus appears to have a weight greater than any known non-metallic liquid at ordinary temperature.

By analysis it gave numbers according with the formula

$$C_2H_3Hg.$$

The formation of this body is readily intelligible from the following equation, if we neglect secondary decompositions,—

$$C_2H_3Hg_2,\ I + KCy = C_2H_3Hg + KI + Cy + Hg.$$

The cyanogen does not, however, appear as liberated gas, but remains behind in the form of paracyanogen.

From the constitution of this substance, the name mercuric methyl is proposed. Should this appellation be accepted, Dr. Frankland's radical would be styled mercurous methyl.

To control the analysis, and further corroborate the formula, the specific gravity of the vapour was taken after Dumas's method. It was found to be 14·86. The weight represented by the formula C_2H_3Hg, divided by the experimental density, gives the quotient 7·73. Supposing the constituents of mercuric methyl condensed into one volume of vapour, the number 7·23 should have been obtained.

The theoretical density of mercuric methyl is $\frac{115}{7\cdot23} = 15\cdot9$. It is, however, more probable that the elements of this compound are condensed into two volumes, whence the formula should be doubled to $(C_2H_3)_2Hg_2$.

Mercuric methyl may also be obtained, but less readily, by employing hydrate of potassa or lime, instead of an alkaline cyanide.

In this reaction much gas is liberated.

$$2(C_2H_3Hg_2,I) + 2KOHO = C_2H_3Hg + C_2H_4 + 3HgO + HO + 2KI.$$

Mercuric methyl exhibits no tendency to unite with the electro-negative elements, such as chlorine, oxygen, &c. All attempts to produce such combinations lead to the destruction of the substance. With iodine or bromine the liquid hisses as if hot metal were plunged into water. Methyl gas is liberated, and the iodide or bromide of mercurous methyl is produced:—

$$\left.\begin{matrix} C_2H_3Hg \\ C_2H_3Hg \end{matrix}\right\} + I = \underbrace{C_2H_3Hg_2\ I}_{\text{Iodide of mercurous methyl.}} + C_2H_3.$$

On the other hand, the action of concentrated sulphuric or hydrochloric acid furnishes hydride of methyl or marsh gas, with deposition of crystals of the corresponding chloride or sulphate.

$$\left.\begin{matrix} C_2H_3Hg \\ C_2H_3Hg \end{matrix}\right\} + HCl = C_2H_3Hg_2Cl + C_2H_3,H.$$

The salts of mercurous methyl, and the radical mercuric methyl, are both decomposed by the action of a dilute acid and clean zinc, into metallic mercury and gases.

Mercuric methyl furnishes with bichloride of tin a crystalline compound, which decomposes, on addition of water, into chloride of mercurous methyl and a soluble tin salt. The same chloride also is produced by the action of terchloride of phosphorus.

Mercuric methyl is a ready solvent of caoutchouc, resins, and phosphorus. It, however, has but little solvent action on sulphur.

Some interest attaches to the circumstance that iodide of mercurous methyl is easily produced by heating mercuric iodide with mercuric methyl.

Mercuric ethyl.

The author has also prepared the radical of mercuric ethyl. From its proneness, however, to decomposition at the high temperature at which the reaction is effected, he has not been able to obtain more than sufficient to make a qualitative examination of the new body. It boils at a temperature above that of water; and burns with a more lurid flame than is exhibited by mercuric methyl.

III. "On Certain Formulæ for Differentiation." By Arthur Cayley, Esq., F.R.S. Received November 26, 1857.

(Abstract.)

In seeking for a formula in the theory of multiple definite integrals, I was several years ago led to investigate the successive differential coefficients of $(\sqrt{x+\lambda} - \sqrt{x+\mu})^{2i}$, and the results which I then obtained are given in my paper, "On certain formulæ for differentiations, with applications to the evaluation of definite inte-